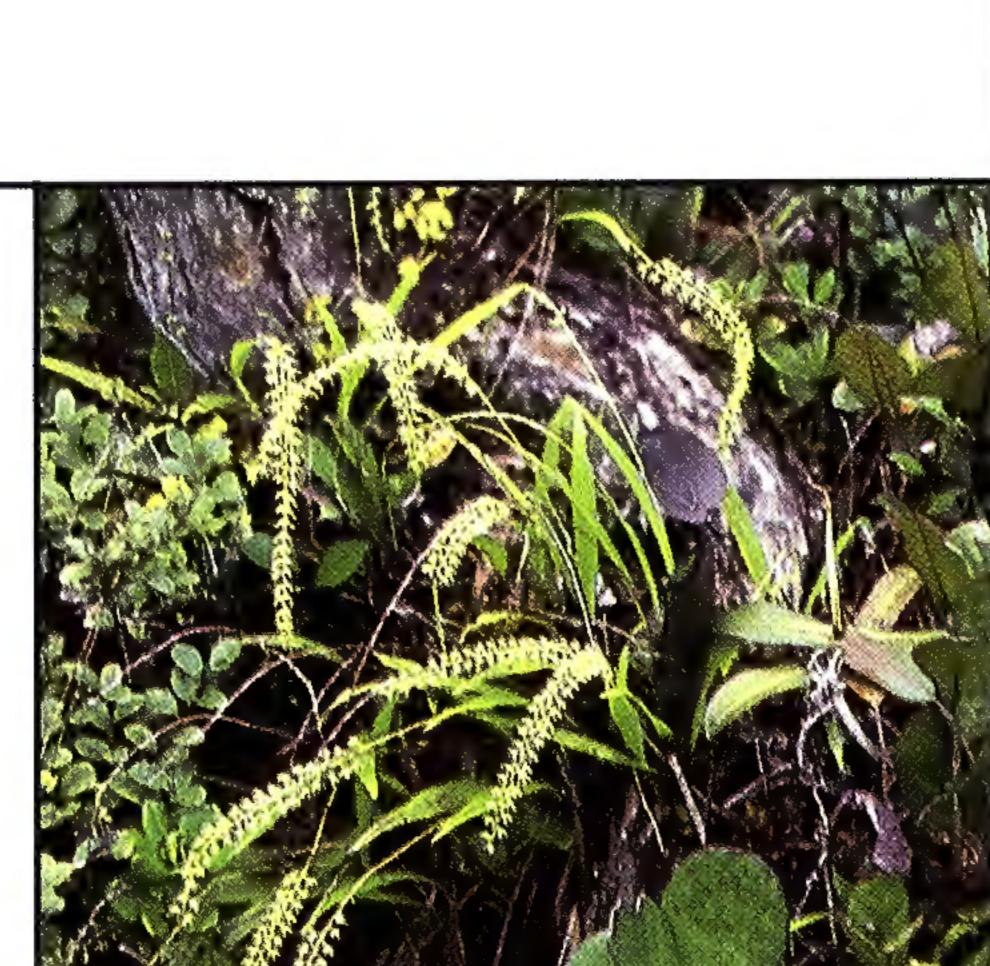


The Orchid Family

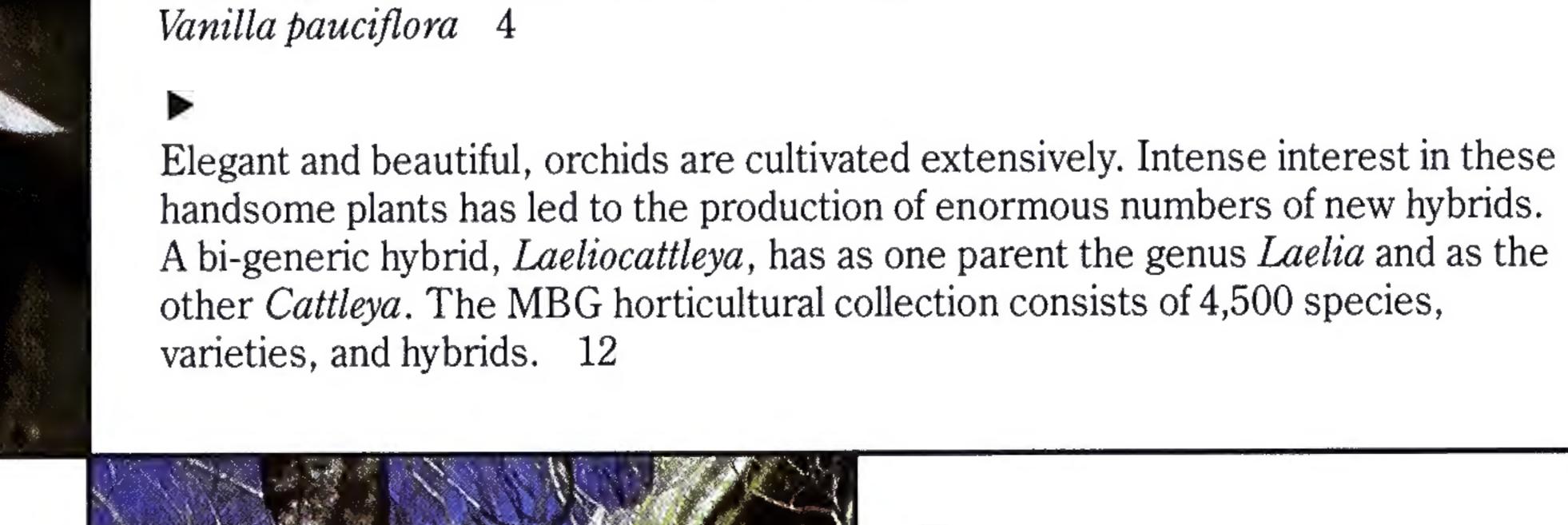
Research at the Missouri Botanical Garden



Family: Orchidaceae, with more than 20,000 species in over 700 genera, is probably the largest of the more than 300 families of flowering plants, and certainly one of the most diverse. Orchids are extraordinary in the plant world because of their unusual ecological adaptations, unique morphology, and specialized pollination systems. They occur throughout the world, ranging from arctic tundra to tropical rainforests. More than 95% of all orchids occur in the tropics, where about one in ten species is in the orchid family. Most tropical orchids are epiphytes, plants that grow on the branches of trees and shrubs in a well-illuminated zone often far above the forest floor. MBG scientist Barry Hammel collecting in Panama. 14



Epiphytic Habit: Epiphytic orchids are found mainly in the tropics. This orchid is a subtropical Encyclia growing on a cactus. In the continental USA and Canada, the epiphytic orchid Epidendrum conopseum grows as far north as the Carolinas and Louisiana. Nearly half of the 210 wild orchid species in the USA and Canada occur in Florida. 5



Economy: Vanilla is the most important agricultural and medicinal species of

a flavoring for another New World favorite, chocolate. The flavor is produced in

the fruit pod, which is called the vanilla "bean." The uncured pods are flavorless.

orchid. A perennial vine native to the New World tropics, it was used by Aztecs as

Epiphytic Structure: Orchid pseudobulbs (water-storage stems) and velamen (spongy, water-absorbing tissue covering the roots) are adaptive structures, responsive to the drastic moisture and temperature fluctuations that occur in the tropical canopy. Taeniophyllum species lack leaves and have almost no stems; the green roots take the place of leaves and manufacture food. 4



Terrestrial Habit: In the North American coniferous forest, a species lacking chlorophyll, Corallorrhiza striata, forms associations with fungi in its roots. The fungi digest dead organic matter and transfer food into the plant. Most orchids form associations with fungi at the time of seedling establishment. In many, these associations persist to the adult stage. 10



Epiphytic Habit: About 70% of all

orchid species are epiphytes,

most of them tropical. Other plant

groups that contain large numbers of

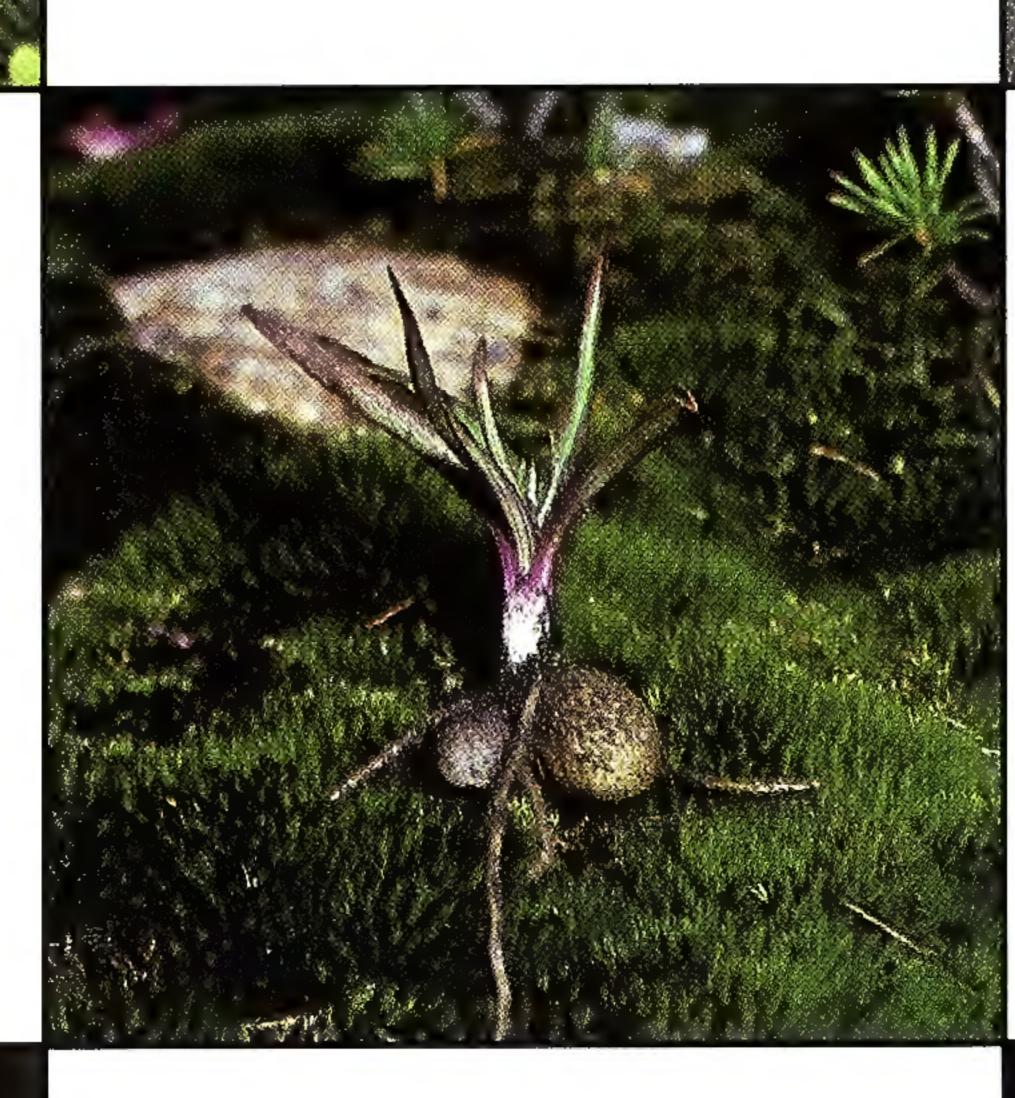
epiphytes are the aroids, bromeliads

and ferns. Tropical cloud forests are

note the diversity in the photo at

particularly rich in species of epiphytes:

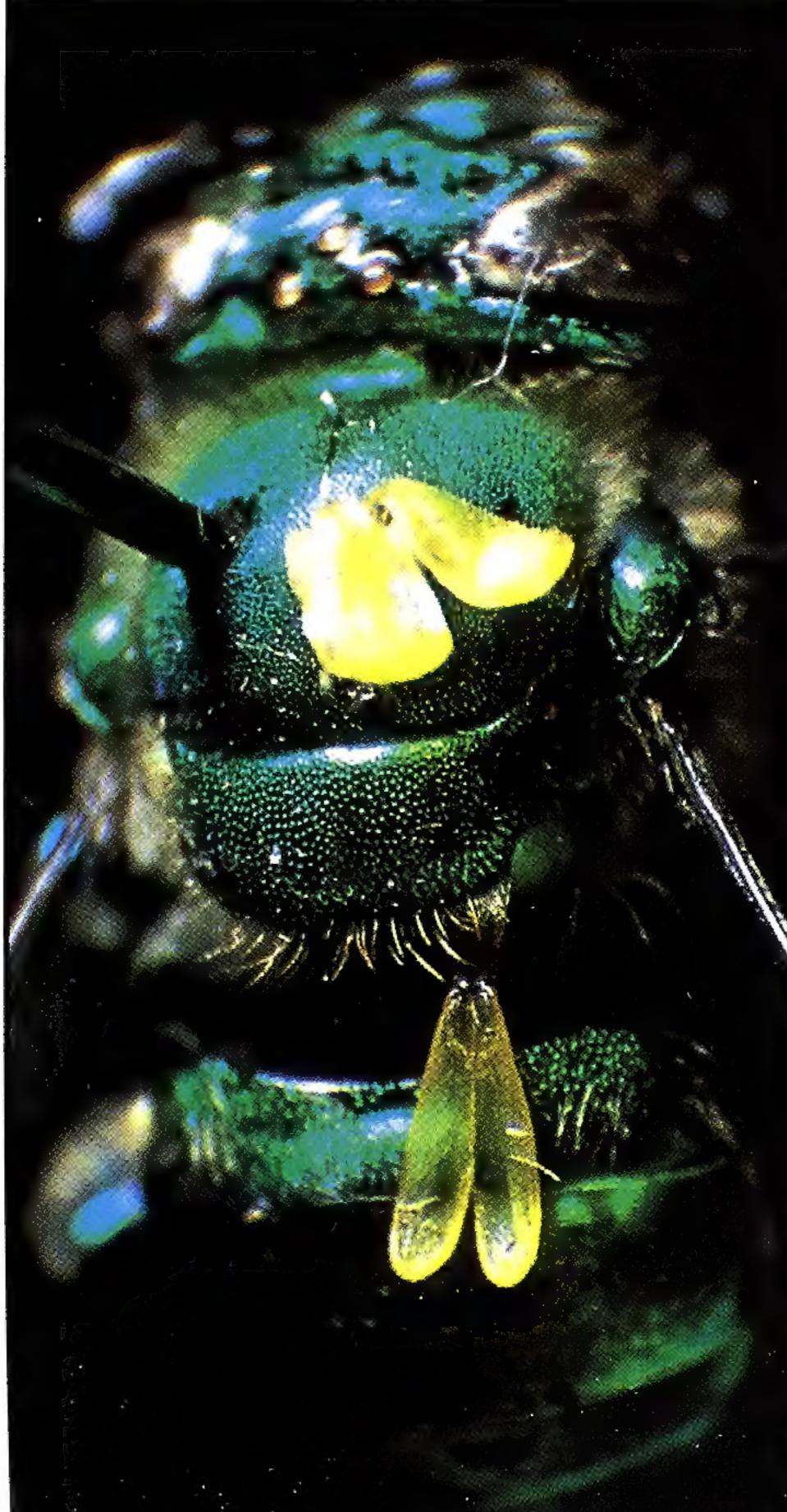
Storage Organs: The storage tubers of Monadenia micrantha from South Africa, illustrate the derivation of the name "orchid," which comes from the Greek word *orchis*, meaning testis. According to the medieval "doctrine of signatures," certain Mediterranean orchids were thought to be effective in treating diseases of the testicles because of their appearance. 4



Flower Structure: Extreme modifications in many flower parts have occurred in orchids. The stamen (male) and the pistil (female) are usually united into a characteristic orchid column. Laeliocattlya, upper right, shows typical modification of one petal into a lip (labellum). The lip on the upper side of the bud ends up on the lower side when the flower opens due to twisting of the flower stalk.



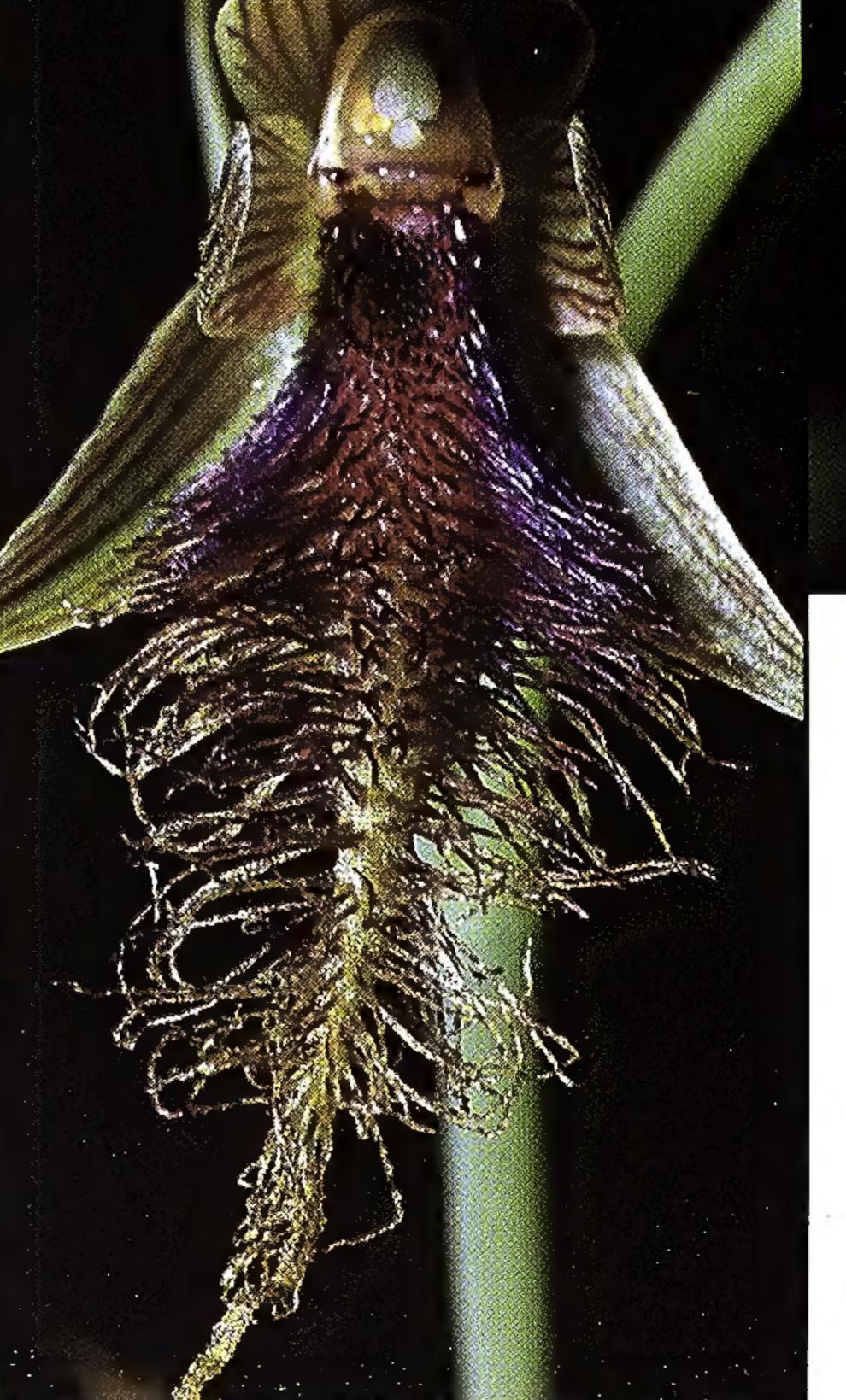
Pollination: Diverse animals—birds, butterflies, moths, bees, ants, wasps, flies and even mosquitos—pollinate the flowers of orchids. The pollination systems are among the most intricate found in any group of plants. Longtongued male euglossine bees, found only in Latin America, collect floral scents which may be used subsequently to mark communal mating grounds.



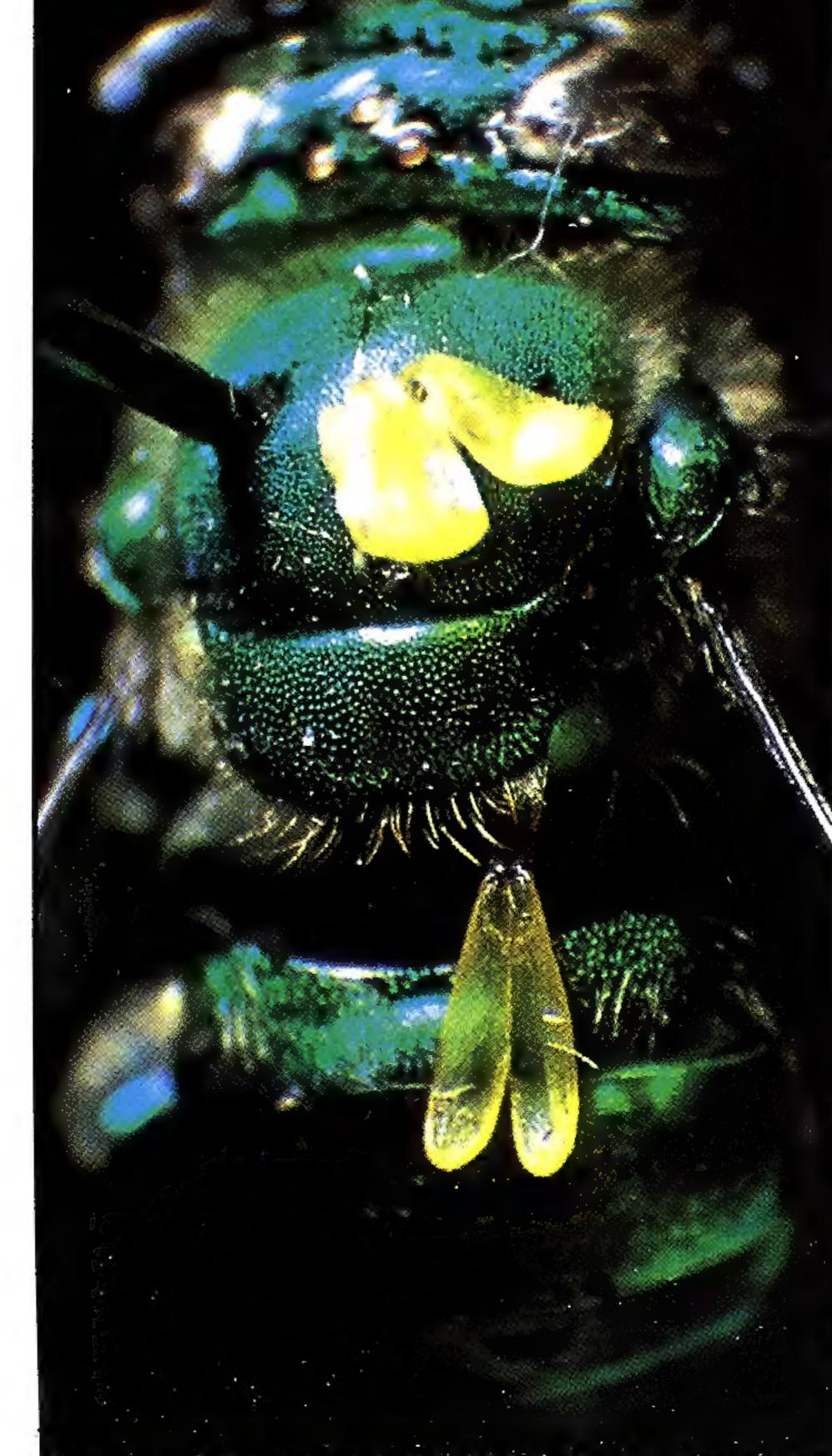
Pollen Packages: Nearly all orchids form pollinia, which are packages that contain thousands of pollen grains. One successful pollination event, therefore, can result in the production of many thousands of tiny seeds. This Euglossa bee carries pollinia that came from two different genera of orchids, Gongora and Peristeria. 16



Wind Dispersal: When mature orchid fruits (capsules) burst, the dust-like seeds are usually dispersed by the wind. These tiny seeds have virtually no stored nutrients to nourish the germinating plant, which is why associations with mycorrhizal fungi (or the provision of nutrients artificially) are so important in helping them to get established. 2



Pollinator: In the New World Tropics, nectar-seeking hummingbirds pollinate Maxillaria fulgens, which signals the presence of abundant nectar to the birds by its reddish color. Hummingbirds, which maintain constant body temperatures, require a more abundant food supply than insects. 5



Extinction and Research: The

research program concentrates

on tropical forests, most of which

permanently altered in the next

20 years. More than 30 Ph.D.-level

scientists, a dozen based in the trop-

ics, and over 50 technicians work to

reference tool, adding nearly 100,000

build the MBG herbarium as a

new specimens annually. 13

Missouri Botanical Garden

are likely to be destroyed or

Pollinator: Most pollination systems in the tropics are unknown. The tiny flowers of Stelis barbata are probably pollinated by small flies seeking a tiny droplet of nectar between the column and the lip. Well over two-thirds of all species of plants, animals and microorganisms occur only in the tropics; the great majority of them are unknown and endangered.



One in Six: About 45,000 plant

species, a sixth of the world's

total, occur in the northern

Andean countries Colombia.

Ecuador, and Peru. This area is

less than a third that of the 48

where fewer than half as many

contiguous states of the USA,

species occur. MBG scientists

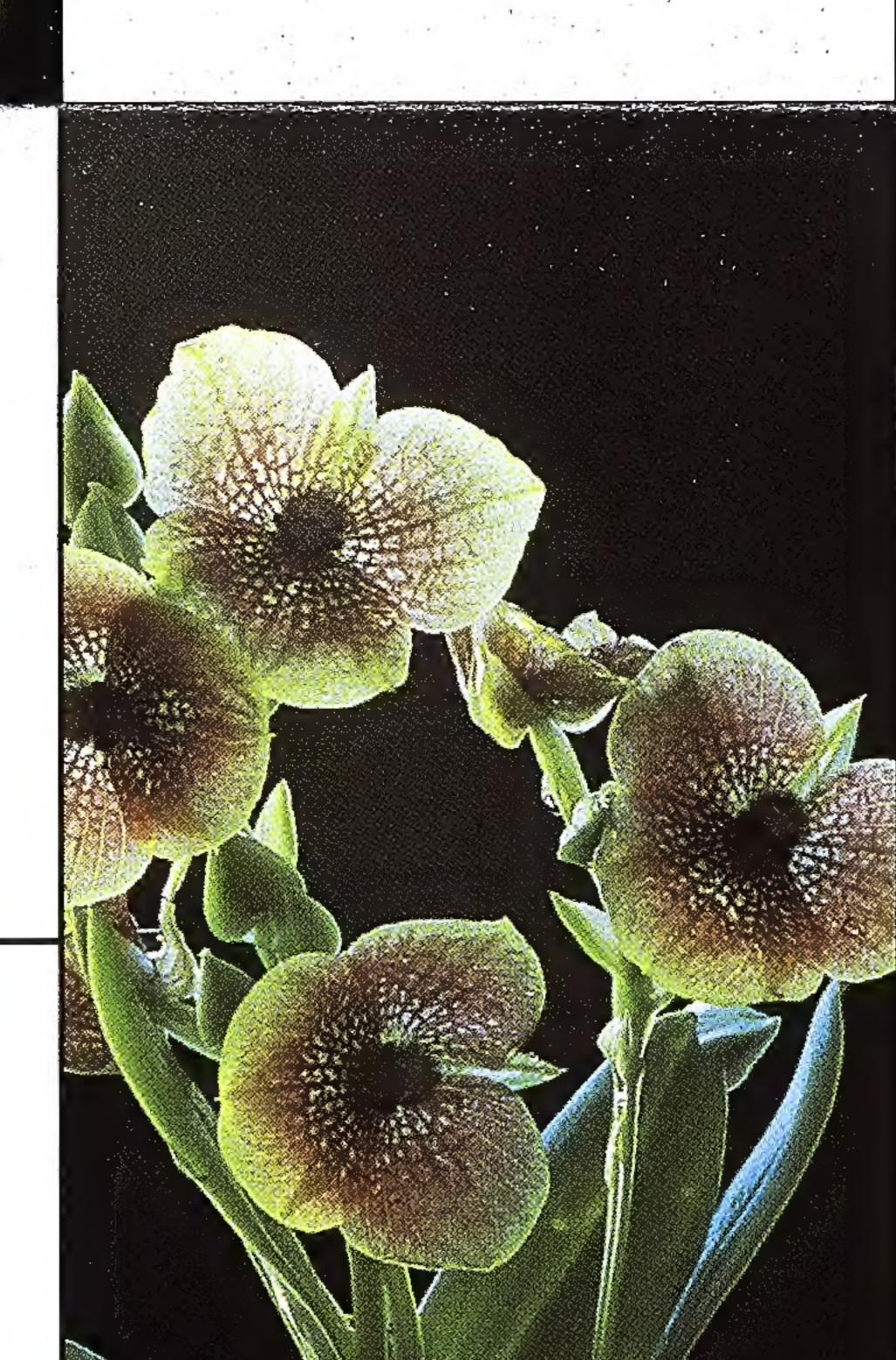
study the some 6,000 species of

yet to be described.

Calaway Dodson and Carlyle Luer

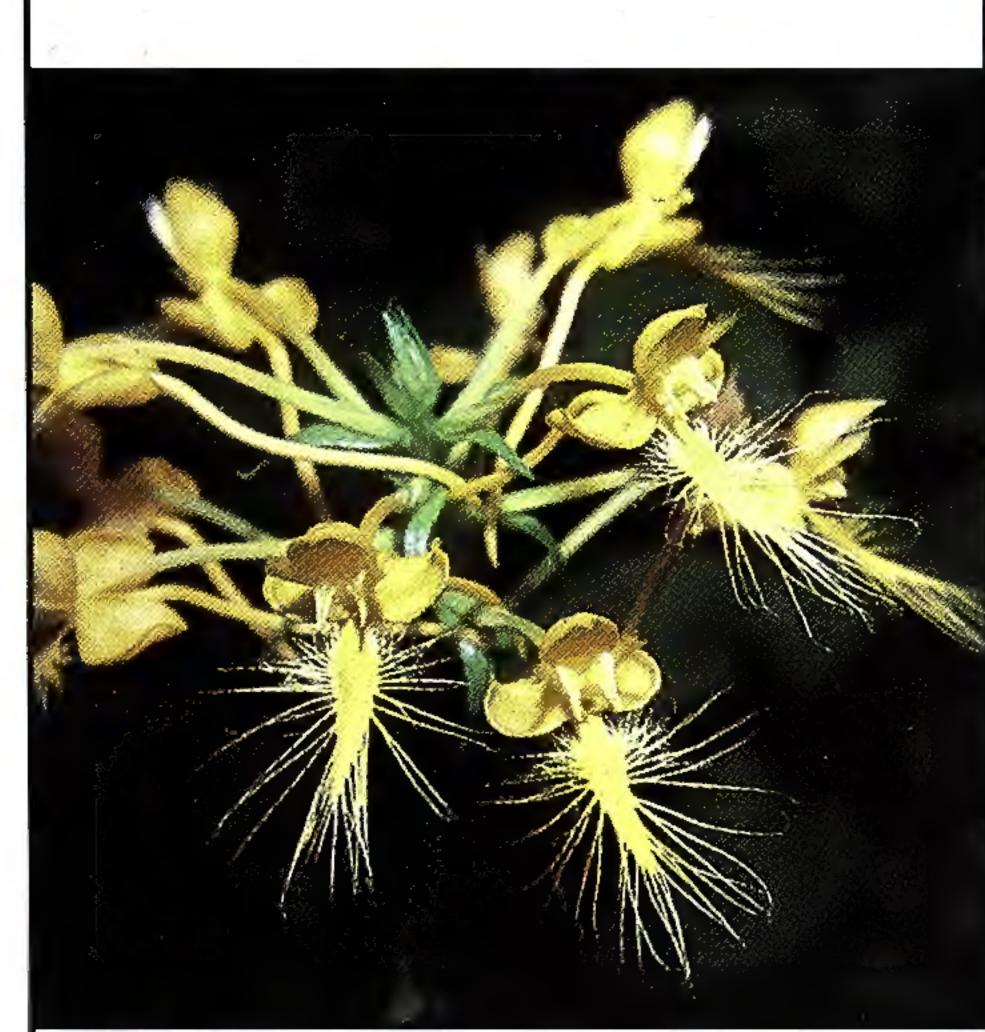
orchids found there, many of them

Pollinator: The "bearded" flower of the Australian orchid Calochilus campestris smells and looks like a female wasp, at least to the male wasp. The flowers are pollinated by the males in search of mates, a phenomenon called "pseudocopulation." Male wasps attempt to copulate with the flowers, and, in doing so, may carry the pollinia from flower to flower, effecting pollination.



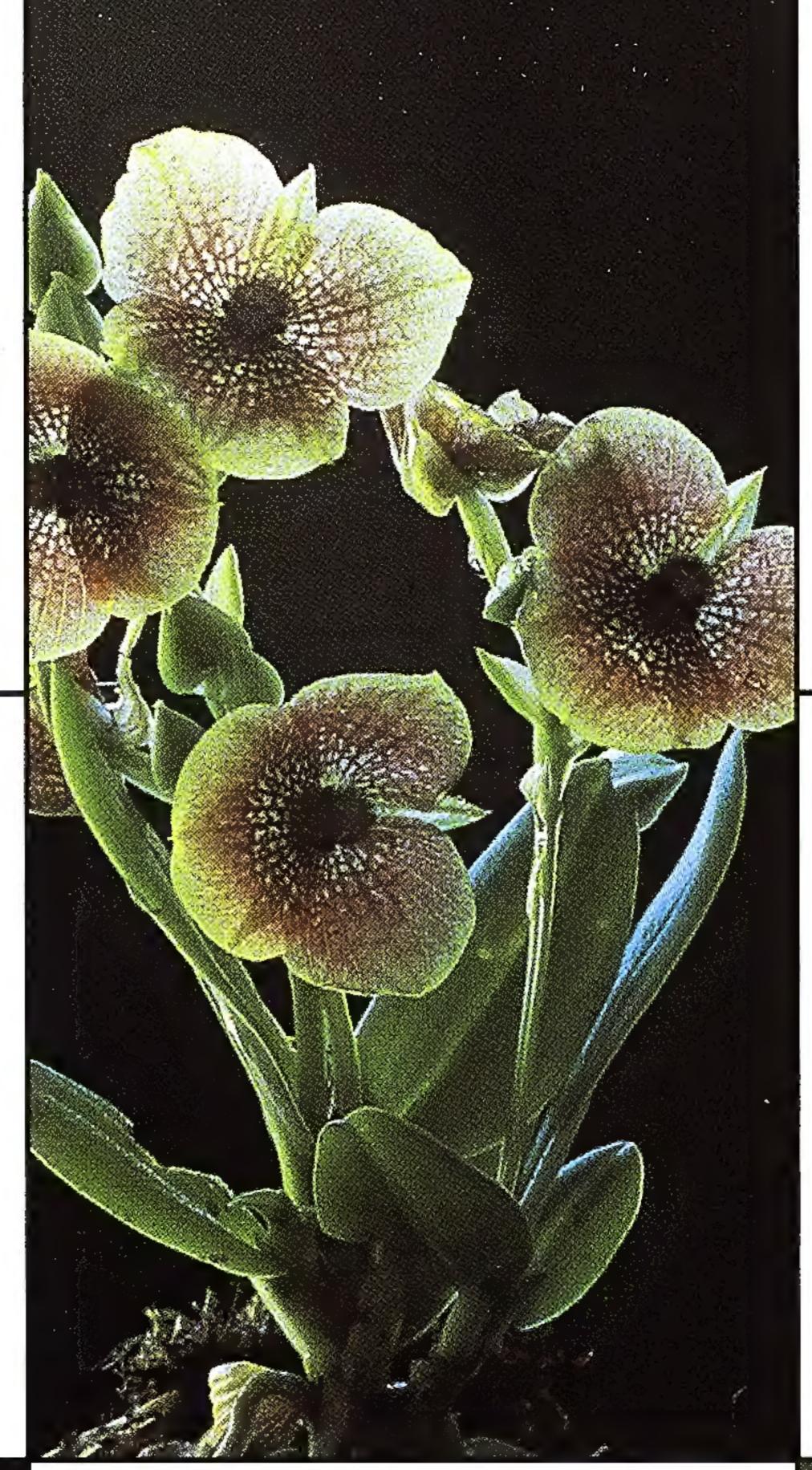
New to Science: MBG scientists published descriptions of 210 new species of plants in 1986. Telipogon thomasii, a new orchid species from Ecuador, was recently described by MBG scientist Calaway Dodson, who studies this genus. The original, or type specimen is housed in the MBG herbarium (containing some 3.5 million specimens), while a duplicate specimen remains in the host country. 3

Tropical Floras: MBG scientists collaborate at different levels with their counterparts in the tropics in the study of the plants of Mexico, Nicaragua, Costa Rica, Panama, Venezuela, Colombia, Ecuador, Peru, Bolivia, Paraguay, Cameroon, Tanzania, and Madagascar. Pleurothallis 9



The Year 2000: The Flora of North America (FNA), coordinated by MBG scientist Nancy Morin, a modern account of some 20,000 species in the USA, Canada, and Greenland, will be completed by the year 2000. No modern flora exists for this region. Platanthera ciliaris, a butterfly-pollinated North American orchid, is one of 210 orchid species known to occur in the USA 11

MBG Center for African Botany in North America: In Madagascar (where 6,500 out of a total 8,500 species are endemic), the ten-inch nectar-filled spur of Angraecum sesquipedale, led Charles Darwin to predict the existence of a longtongued moth. The moth was actually found 40 years later; its specific epithet, praedicta, records Darwin's insight.



Evolutionary Relationships: Systematic botany investigates the relationships between species. The two orchids at right, studied by MBG scientist Carlyle Luer, were once considered members of the enormous genus *Pleurothallis*, but ongoing research has led to the reclassification of these species. 13, 9



Botanical Library: MBG has one of the world's finest botanical libraries, containing over 90,000 volumes and a fine collection of rare, early botanical works. This plate of *Disa grandiflora* is from John Lindley's Sertum Orchidaceum, which was published between 1837 and 1841. Besides being beautiful to look at, these works are

important in botanical research.



Classification: Plant families are often divided into subfamilies or tribes, which are groups of related genera. With enough information, major evolutionary groups are often apparent, althought he boundaries between such groups may remain obscure.



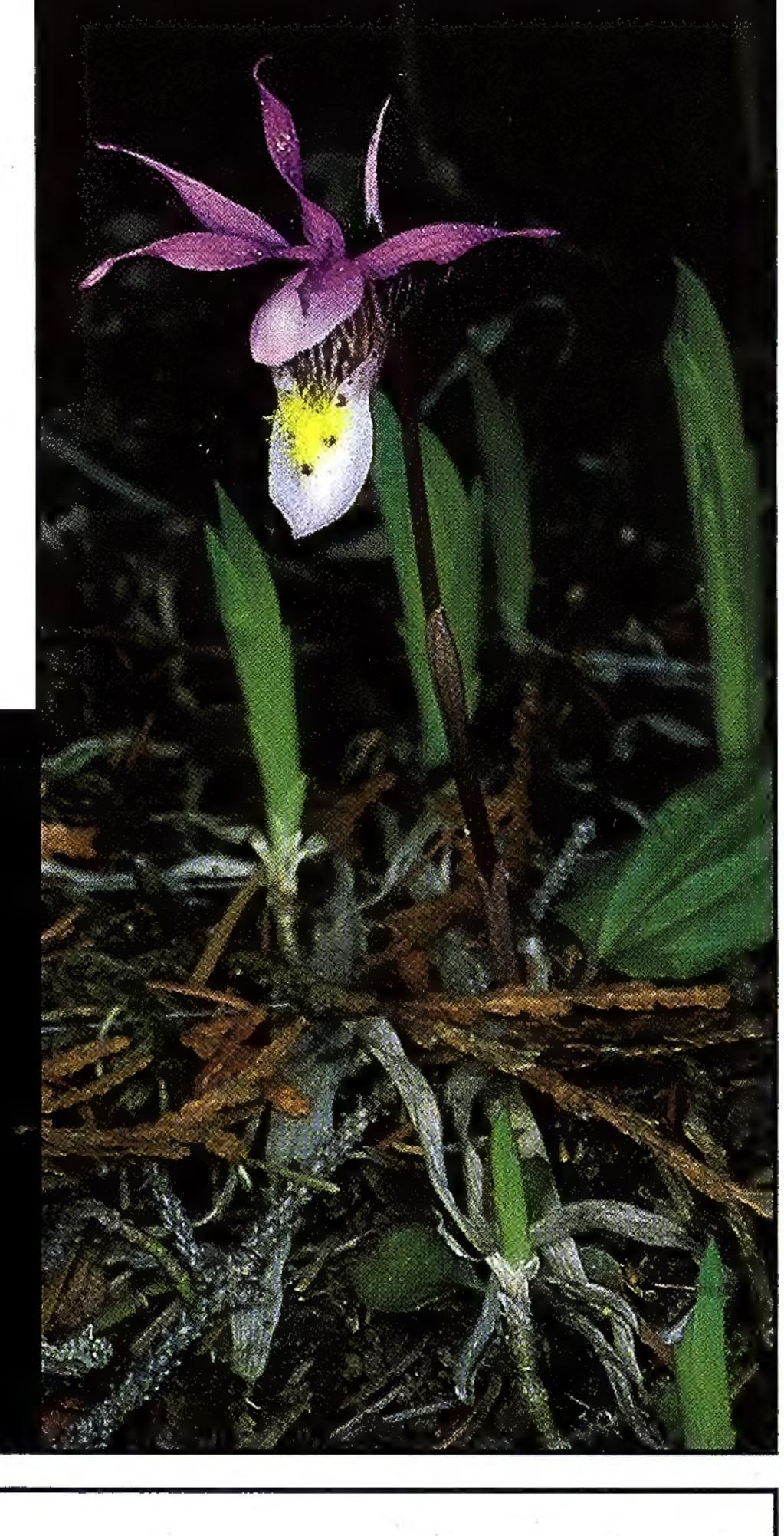
Cypripedioids: Of the 32 orchid species native to Missouri (total Missouri flora=2,500 species), 14 are rare or locally endangered. Cypripedium reginae is one of Missouri's endangered orchids. Onethird of all orchids are threatened with extinction. Scientific study, habitat preservation, and cultivation of these beautiful plants are all important for their conservation. 6



Neottiods: Bipinnula mystacina, from Chile, has beautiful and unusual fringed lateral sepals. 8



Epidendroids: This large and very spectacular, yet diverse, group includes such well-known orchids as Laelia and Cattleya. In the USA about \$15 million worth of cut and potted orchids are sold each year. Calypso bulbosa is a beautiful Epidendroid orchid of northern conifer forests in North America, Europe and Asia. 15



Epidendroids: Large and flamboyant orchids such as *Cattleya* are no more beautiful than some of the very small and delicate members of the genus Lepanthes. 2

Dira grandylow

Sobralia rosea has lovely flowers that last but a few hours. 1



Vandoids: Vanda and Phalaenopsis, both native to the Old World Tropics, are among some of the common members of this large group. Houlletia tigrina, shown here in Panama, is pollinated by euglossine bees. 4

Dedication

The Board of Trustees, Director and Staff of the Missouri Botanical Garden dedicate this poster to Mrs. Anne L. Lehmann and her late husband, John S. Lehmann, for their vital and continued support of the Garden's efforts to explore, understand, conserve, and manage tropical plants.

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